Go fly a KITE ANTENNA

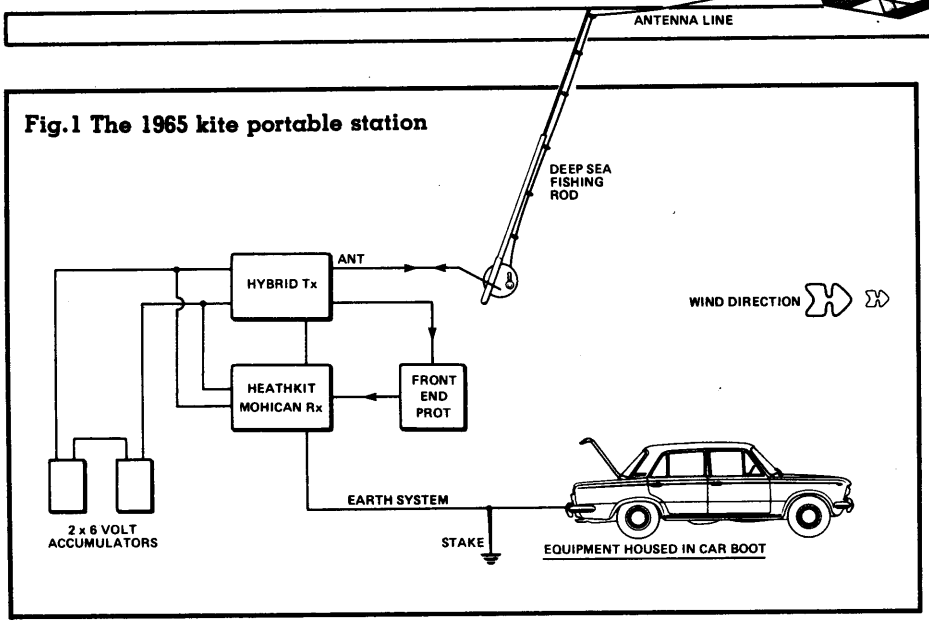


Fig.1 The 1965 kite portable station

Throw all caution to the wind, and let a kite lift your signal! Mike Grierson, G3TSO, explains all...

On a cold clear Sunday afternoon in the winter of 1965, a small group of newly licensed radio amateurs gathered together and set out on a portable expedition into the Northamptonshire countryside. This had to be a joint venture, as no one individual owned enough equipment to mount the operation solo.

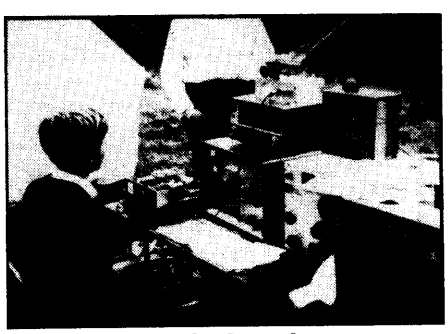
Twenty years ago, portable operating was quite a formidable task; most of the equipment was large, heavy and full of valves which, by modern standards, consumed enormous amounts of power. It was not uncommon for a portable transmitter receiver combination capable of running 10W DC input on AM, to require up to 20A from a 12V source. I can even remember one system that consumed no less than 16A on receive alone! Valve heaters provided a steady drain on the batteries, whilst rotary DC-to-DC converters were the major and inefficient(!) source of high tension supplies.

The equipment used on our portable expeditions was then somewhat revolutionary. It comprised of a Heathkit Mohican all transistor receiver, which blew its front end everytime the transmitter was switched on — until we modified it! The transmitter was a homebrew 'hybrid', designed and built by the author. This used only three valves and featured a transistor modulator and a transistor DC-to-DC converter; a pair of ex WD accumulators provided the power supplies and 600 feet of wire, a medium sized kite and — wait for it — a 'deep sea' fishing rod made up the aerial arrangements. Of course, a car was essential to transport the party and all the heavy equipment to the expedition site.

A short drive into the nearby countryside revealed a number of suitable locations for kite-born antenna 'flying'. At first sight any open space would appear suitable, but there are a number of very important considerations to be taken into account. When launching a kite antenna, a considerable amount of space is required. The site should be well away from all overhead power cables (at least a half mile) and far enough from major and minor roads, such that when the kite and antenna plummet earthwards out of control, it will not do any damage or cause injury to either the operators or members of the public. I can recall several anxious moments listening to the gentle purr of a Lambretta coming down an otherwise deserted country lane, as 600 feet of antenna floated gently earthwards. The antenna did cross the road but fortunately for all, the rider was not garotted. On another occasion, I remember being evicted by an irate policeman from a superb site and what we had assumed to be a disused airfield — unfortunately this was still used by a local flying farmer.

Fishing For Signals!

Kite flying can be an absorbing pastime in its own right, just trying to keep one airborne for half an hour can be something of a challenge. Add to that the complication of trying to tune up an antenna which is constantly changing its dimensions and orientation and you have some idea of what kite antenna portable operation is all about. In practice, with a group of operators and a little organisation, very successful operation is possible



G3TZJ working the homebrew 'hybrid' transmitter in 1965.

for long periods of time. The single operator will have to work like the proverbial one armed wallpaper hanger.

The kite used on many successful portable expeditions was a commercial design, bought from a seaside model shop. It was hexagonal, measuring some 4 feet across and was constructed of a plastic material stretched onto a wooden frame. This proved to be an excellent design, capable of very stable flight in very light winds and also possessed of the ability to remain airborne for long periods whilst tethered to a tree or other similiar mooring point.

The antenna wire doubled as the kite line and was attached to the kite via a 'fishermans swivel' (available from all good tackle shops), which allowed the kite to rotate without twisting the line. The antenna wire was rescued from a dinghy emergency radio and had been specially adapted for operation with the kite. It comprised of a fine copper braid with a strong nylon inner line providing strength, light weight and good conductivity. A reel is required to store the wire and allow it to be paid out and recovered in an orderly fashion. David, G3TSN, found an old deep sea fishing rod and reel in his cupboard which was ideal for the job. The antenna wire was wound onto the reel and fed up through the eyelets to the end of the rod where it was attached to the kite. The fishing rod proved to be an excellent launch vehicle and one airborne, the kite would pull out the line by releasing the trigger brake on the reel. The winding handle provided a rapid wind-in system for recovering the wire when in top gear. I must admit we got some very strange looks from passers-by, standing in the middle of the countryside, miles from any water with a fishing rod and line! The kite was normally too far away for the casual observer to notice.

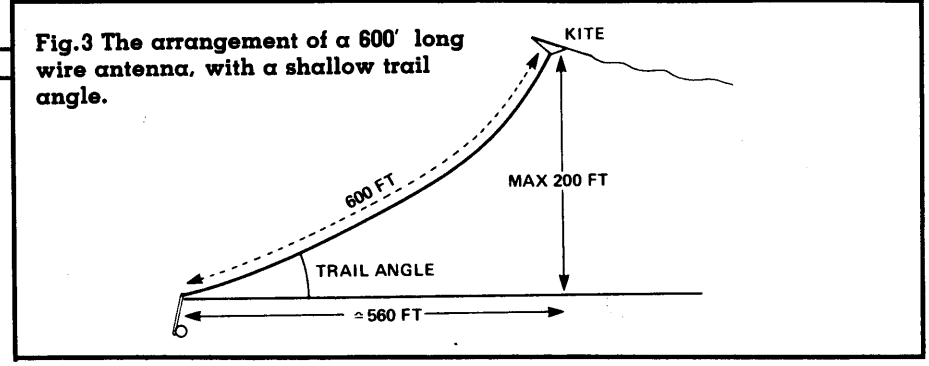


Fig.3 The arrangement of a 600' long wire antenna, with a shallow trail angle.

Attachment to the transmitter was simple; a 'flying lead' *(how appropriate — Ed.)* with crocodile clips was connected directly between the antenna wire and the transmitter antenna socket — no aerial tuners or SWR meters were ever used. The flexibility of the transmitter pi-tank circuit, combined with aerial length adjustment was all that was required. The PA current would be dipped and the antenna loaded; if it would not load, simply pulling the trigger on the fishing rod sent another length of wire skywards and completed the loading operation. A final adjustment of the PA tune resonated the PA and we were on the air. This delightfully simple approach was characteristic of methods of matching antennas 20 years ago but probably terrifies rig owners with solid state PAs.

Antenna lengths varied from as little as 150 feet to a maximum of 600 feet, which was the most that could be launched into a moderate breeze. Whilst the antenna wire was fairly strong it did break ocasionally, allowing the kite and a length of wire to set off across country, followed hotfoot by a retrieval party. Fortunately, kites do not usually stay airborne for long once the line is broken, but even with this in mind may well depart with a long length of wire attached, so beware the power lines. On one memorable portable expedition to Derbyshire, the line broke at least three times in one afternoon. Unfortunately, we were operating from an isolated hill top overlooking Dovedale and the long trip to the valley floor and back with the kite became a little tedious after the first time.

The transmitter used was capable of operating on any 4 of the 6 amateur bands but was primarily used on 80 metres, with secondary operation on 160 and 40 metres. With a DC input power of some 7—10W on AM, and an antenna of approximately 600 ft (or 2¼ wavelengths) long we found no difficulty in competing with home based stations running the full 150 watts. Once established on a band, we attracted a number of fairly large pile-ups and achieved some very satisfying QSOs and reports — interspersed with the occasional collapsing antenna. It was amazing how quickly we could finish a QSO when the antenna was seen drifting earthwards — and perhaps equally amazing the number of QSOs that continued with the antenna on the ground!

Many of the lessons learned 20 years ago are still relevant to kite flying operation today. Modern equipment is more portable and power consumption is much less; however, modern equipment design may have made the actual operation much more complicated especially when it comes to matching the transmitter to the antenna.

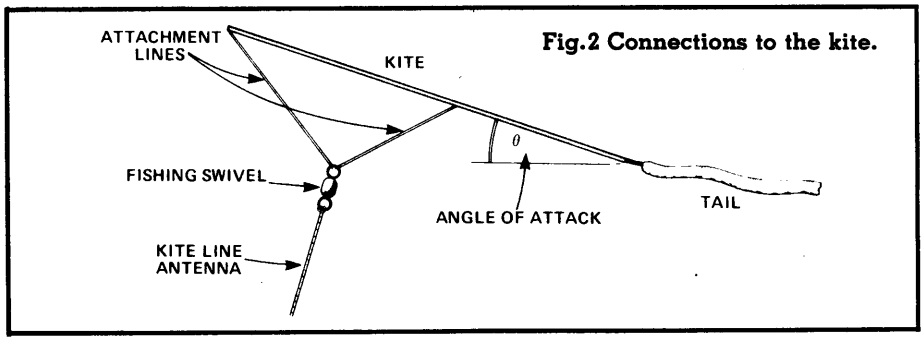


Fig.2 Connections to the kite.

Choosing Your Kite

In recent years the aerobatic or stunt, kite has become a common sight in this country and is readily available in shops, but unfortunately it is not suitable for amateur radio purposes. It is designed to be aerodynamically unstable and normally requires two control lines in order to fly it successfully. For our purposes, the aerodynamically stable design of the traditional kite is essential. The hexagonal design has a greater surface area than the conventional shaped kite and should produce more life as a result. This will enable the kite to perform

better in lower wind speeds. The hex' kite could be launched in surface winds of as low as 3 to 4 knots and possess excellent stability once properly trimmed for flight.

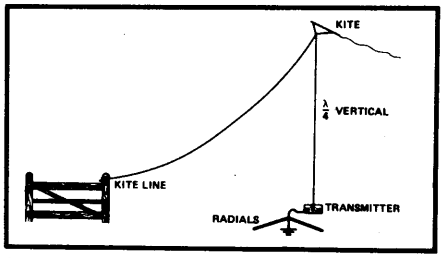
The box kite, once readily available in sea-side towns, is another excellent stable design and was made for use with the emergency radios mentioned earlier. If one of these ex-WD kites can be found, it is ideal for portable operation and is of splendid construction. The only possible drawback is that it usually requires typically 8 knots of wind to successfully launch a kite of this design(!) but once airborne, is capable of staying aloft for some considerable time.

There are two adjustments that can be made to trim a kite for optimum performance. The angle of attack — that is the angle between the kite and the airflow — can be adjusted by varying the length of one of the attachment strings **(See Fig. 2).** Increasing the angle of attack increases the lift and also the stalling speed, making the kite very susceptible to a sudden drop in wind speed. The optimum angle should be determined experimentally; once fixed, this will seldom need to be changed. The second adjustment is to the tail of the kite. This is not just a pretty streamer, but a device to aid stability particularly in strong and squally conditions. The tail length required will vary, with wind speed and again the optimum length determined experimentally. A box-kite is seldom used with a tail.

It should be mentioned, at this stage, that there is a maximum height at which a kite can legally be flown in this country — 200 feet above ground level except when within half a mile of an active airfield, where the limit is 50 feet. In practice, a 600 ft long wire will not normally exceed 200ft in height when flown from a kite due to the rather shallow trail angle **(Fig. 3)** caused by the weight of the wire.

The Antenna Wire

Perhaps the most important aspect of kite borne antenna operations is the antenna wire itself. This should be light in weight, strong (the pull on a kite can be considerable), a good conductor and of the type that does not twist and tangle easily. Without a doubt, the



'surplus' braided wire with a strong nylon inner is the best type yet found by the author. This was made in large quantities and can occasionally be found in emporium that sell 'surplus' equipment. My supply was on a yellow wooden drum, fitted inside a dinghy emergency radio. These radios were colloquially known as 'Gibson Girls' after the New Yorker magazine's drawings of scantily clad females in the 1920's. The radios were operated by a hand generator and gripped by the operator between the knees. The 'Gibson Girl' remained a part of aircraft emergency equipment right up until the middle sixties.

Another equally important point to be able to control the antenna wire, and whilst not everyone will have a deep sea fishing rod, some form of drum with a winding mechanism is required. A mechanical stop or brake is essential to prevent the kite from pulling out more wire than required; not forgetting a means of fixing the kite to a convenient anchoring point — unless you are happy to hold it all afternoon! The use of fly leads with crocodile clips makes connections — and equally disconnection should it be necessary — to transmitting equipment easy.

Flying and Operating

Once a suitable kite has been found and air tested for optimum stability, an attempt can be made at launching an antenna. Although I prefer the simple approach of using the kite line as the antenna, there are other possibilities, such as suspending a vertical antenna from the kite line. Once your selected antenna is in the air supported by your kite, it will be necessary to tie it off to a suitable anchor point such as a tree, fence post, car door handle or whatever takes your fancy. This is usually the greatest test of the suitability of your particular kite, will it still fly without you pulling in the line?

Some form of earth system will be required for the antenna and take various forms — from 'long wire' type counterpoises to a simple earth stake or the car body itself. Ancillary matching equipment will need to include an SWR bridge and some form of aerial tuner. Most commercial ATU designs are not suited to long wire operation and a simple homebrew 'L-match' arrangement is ideal. Try to keep your antenna length to an odd number of quarter waves on the band(s) in use and any matching problems will be minimised.

If the idea of going into a field with that expensive new 'solid state' transceiver and connecting it to an antenna as dubious as a kite wire doesn't appeal to you, there are still enormous possibilities for QRP operation. Even the low power output from a modern transceiver could be used to drive a simple homebrew QRP PA stage running 1 or 2 watts of SSB. Another factor in favour of QRP operation, is that 100W into a very long wire antenna can produce a potentially RF 'hot' antenna, ATU and transmitter, particularly if you don't keep the length of the antenna to an odd number of quarter waves. If you have children around, the use of low power is very strongly recommended.

As a final word of warning, when handling long lengths of wire attached to a kite, beware of static build-up or some nasty shocks can result. As a general rule, don't fly a kite antenna on a day when there are active thunderstorms in the vicinity and watch out for static build-ups particularly when there are rapidly growing cumulous type clouds about. A receiver covering the 160m band will give a good indication of static activity.

I am sure that there must be a large number of amateurs who have contemplated launching an antenna with a kite, but in reality there are probably very few who have actually got around to putting these thoughts into practice. In 20 years of amateur operating, I doubt that I have heard more than half a dozen stations using a kite antenna. Operation is not quite as simple as it may appear, but with a little thought and planning, successful operation is very feasible. Radio with kite antennas is an *excellent* way of taking the hobby out of the shack and into the open air with a few friends.